



RVator's Log

Newsletter of the Twin Cities RV Builder's Group

December 2018

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Upcoming Events

December 15 - Twin Cities RV Builders December Meeting - The RV Roundtable. Lake Elmo Airport.

See page 12.

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**Minnesota Wing
Van's Air Force**

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Shop Notes

- Doug

It's November... it's cloudy and gray and I haven't been able to fly the RV in a week with all of the crummy weather that has engulfed us. The -7 has passed the 700-hour mark with little issues. Several memorable RV trips reside in the logbook but I'd like to spin a true tale of one of my most memorable trips... even if it was in a Cessna.



It was 1999 and our family was halfway through a two-week trip to Australia. A Qantas 747-400 brought us first to Sidney for a couple days but our final destination was Townsville, Queensland in the northern part of the country. We had traveled to spend some time with our friends Ross and Sandra who have visited us many times (most recently last winter). At that time Ross was building an RV-6 and was actively involved in the local flying community. He had been renting a Cessna 210 quite often so it was natural for us to set aside some time for a flying trip. Ross had planned out a two-day flight that would take us north from Townsville along the Great Barrier Reef past Cairns to a jungle airstrip named Cow Bay about 200 miles up the coast. We would spend some time exploring and then fly back south to Cairns for an overnight and then back to Townsville. He had been to Cow Bay several times and explained it was a long 3900-foot grass strip right in the middle of the Daintree rain forest about a mile inland from the ocean. There was an interpretive tourist center within walking distance of the airport and a chance to experience some "jungle" flying.

The C-210 he had been flying seemed like a nice enough machine. It was not my idea of a bush plane but it had six seats and with a reduced fuel load, could easily handle Ross and I plus Jean and our two boys (ages 15 and 13). Personally I was



along for the ride, as I had no idea how to plan for a flight in Australia. Ross did a lot of planning and a VFR flight plan was filed as required. Ross and I were up front with me in the right seat and the family in the back. We departed Townsville under a 2000 foot overcast sky and leveled off about 1500 over the ocean and headed north up the coast.

Loading up for departure from the Townsville, QLD airport

We flew past the big airport at Cairns and soon arrived at Cow Bay. Ross invited me to take the controls and make the landing to the north. It had been about 10 years

since I flew a 210 but I thought I could figure it out. As we circled over the airport it became apparent this was a one-way strip cut out of the jungle with a small mountain at the south end. Going around didn't seem like a viable option. He assured me it had a nice grass surface and ran up hill landing south. Being almost 4000 feet long, we did have plenty of room. I came in over the tall jungle trees and used very little runway with the gradual up hill gradient. Taxiing up to the parking area at the south end we stopped and shut down. Not a soul around except some strange jungle birds squawking in the dense jungle. Now that we were here, I thought to myself that we still have to take off downhill, climb out over the jungle (with really tall trees), in a strange airplane with my family in the back. The worry meter began to climb.

Ross said it's only about a mile walk along the narrow two-line road to the nature center. So we set off, with Ross and the kids in the lead and Jean and I bringing up the rear. I really don't think we had gone a hundred yards when I hear this



cracking sound in the jungle to the right of us which lead to a crash as a huge tree fell out of the forest and smashed on to the road about a hundred feet behind Jean and me. Strange jungle birds scream in alarm. Heart rates peg out as Ross runs back to the tree and determines that termites were the culprits. Apparently they had been munching away for years and years and just as we walked past, the old tree finally succumbed. Ross told us when we arrived that most Australian animals want to kill you. I guess so do the trees. For me, this adventure to the wilds of northern Queensland is beginning to fade. Worry meter is approaching redline.

We walk around the nature center for a while; all I can think about is that takeoff we still have to make. We hike back to the airport and we get all strapped in and ready to go. Fortunately there is no wind, it's fairly cool and our takeoff is downhill. But those trees still look kind of tall to me. Ross is going to fly this time and he puts down 10 degrees of flaps. We snuggle right up to the far south end of the strip and he feeds in the power to the 300 hp Continental. As we start to roll, I'm having this conversation with God just to keep this engine running till we get over the trees and to the beach about a mile past the end. We accelerate fine and with the long strip, we have plenty of room. But just as Ross rotates and we lift off, I catch sight of one of those strange jungle birds flying out of the trees to our right. He looks as big as the Cessna. He's going to cross right in front of us and I thought for sure we were going to hit him, but he passes right under the wing. No one says a word as we climb over the trees and then cross over the beach. Worry meter well past redline.

Everyone but me seems to be having a good time as we head south back to Cairns following the coastline. The plane is running OK, the weather is OK, but I've had enough adventure with old dead trees and giant pre-historic birds trying to kill us. As Ross calls the tower at the Cairns airport, I'm just observing since I really am not familiar with Australian ATC procedures. We are about 10 miles north when the tower man cancels our entry into their traffic control area as a Qantas 737 is inbound. Little toy airplanes are not allowed anywhere near the airport until Qantas is safely at the gate. We are to circle at a specified VFR holding point outside their airspace. We are flying about 1000 feet above the water along the shoreline since the ceiling is still about 2000 feet. The holding point is a little town nestled in a U-shaped bay surrounded by 1000-foot hills. Ross motors into the bay at 180 mph and starts circling over the town rather low and going really fast. The hills zoom past our windshield as we do a series of 360's in a 45-degree bank. After

about 5 minutes of this, I kindly suggest that we head back out over the water since the South China Sea is really big and there are no trees staring us in the face. Finally Qantas lands, shuts down, and we are allowed to enter the sacred airspace and land. By the way there was no other traffic anywhere near us.

Jean is a pretty savvy co-pilot so she has had enough of all of our flying adventures. The kids thought it was a blast. We tie the airplane down and get a taxi into town for dinner. The kangaroo and crocodile sampler plate was interesting but I think we had had enough excitement for one day. But wait... there's more!!! Ross is calling the shots and is rather frugal when it comes to hotels. We walk to the local youth hostel where the rooms are \$20 a night. The place swarms with noisy backpacking kids from all over the world. We get two rooms: Ross in one, Jean and I and the kids in the other. It is furnished with two frumpy single beds and that's all. Not even a chair. Bathrooms down the hall. The backpackers are really loud. Jean breaks down in tears...

We spend the next morning exploring the rain forest around Cairns and fly back to Townsville late in the afternoon. It was an adventure notwithstanding termites, Cessna-eating birds, grumpy Aussie controllers, and partying backpackers. Breakfast runs to Brainerd seem so mundane.

Epilogue.... Looking back on this flight from almost 20 years ago, I ask myself whether it was wise to I have flown a strange heavily loaded 210 into a one-way jungle airstrip with my family on board (who at the time were 100% confident in my judgment). With the "wisdom" of old age driving my hindsight, I would say no way. Today, I do everything I can to keep the worry meter at the low end of the green arc!

12 years, 2,100 hours, 12,000 Gallons of Gas, and 63 Gallons of Oil

- Pete Howell

After great 12 years and 2,100 hours of flying my RV-9A, I thought it might be fun to recount the history of my little motor.....

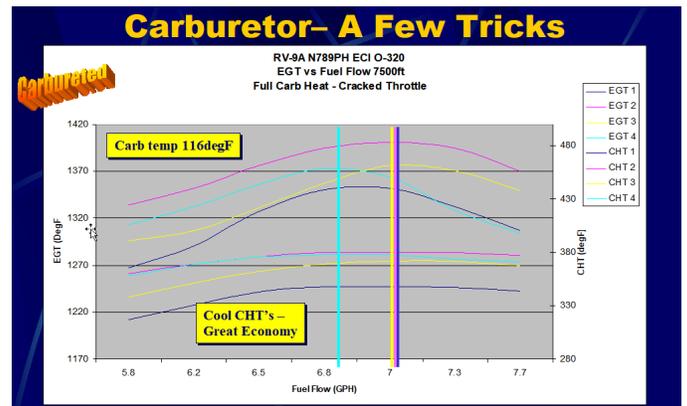


It all started in November 2005, I was 2 years into my RV-9A build and realized

the wallet needed to open up for the engine. I talked to a few people and got hooked up with Robbie Attaway, who spent a lot of time going over options and led me to America's Aircraft Engines in Tulsa where I could spend a few days to "help" build my engine. I settled on an O-320 ECI kit engine with a carb, P-mags and a CS prop option. The scheduled day arrived, and off to Tulsa I went. I knew nothing, but the guys at AAE were patient and showed me me the ropes - I was somewhat useful, but I'm sure I slowed the process quite a bit! At the end of day 2 we were done and the next week an engine showed up at my driveway after 2 hours on the test stand. It sat in my garage for a few months until it was hung and then about 10 months later, we moved the whole she-bang to the hangar where I put her all together and fired her up!

Limited ground testing went well other than a Facet fuel pump that crapped out after running for 15 minutes - the autopsy found some gunk in it that must have been in the QB tanks. A quick trip to O'reilly ~~Auto~~ Aviation had a new pump online in less than an hour. After more than a few white glove inspections, some rank amateur named Weiler did the first

flight. Heavy wing, trim wired backwards, but the rings seated and the CHTs came down in 15 min. I was a happy guy! Per ECI guidelines, I used Phillips XC 20W-50 for break in and have been running it ever since. It's cheap and seems to work just fine. Doug flew with me until he was no longer scared, (or too scared) to fly with me anymore, and turned he me loose in the "box". I ran her hard for 25 hours and changed the oil - it looked great, so I refilled and flew on. From the outset, she has used a quart of oil about every 20-25 hours. I only put 5qts in, because the rest just lubes up the pretty white belly of my plane. 5 qts seems to work just great, so that is what I use. At



that rate, I've put **63 gallons** of oil in my baby!

At this point, I was out of the box and flying places. Gas is expensive! I read about LOP ops online and learned a bunch from Alex Peterson. We took lots of data and made pretty graphs that told us that a carb engine is pretty bad LOP, but with some experimentation, we found that at 8000ft, with ¼

carb heat on, WOT, she runs LOP just great. Balanced, cool CHTs and a nice 6GPH burn will get you 150KTAS! She will also run partial throttle 130KTAS at 5GPH. I run at one of these 2 settings 90+% of the time to the tune of 175 hrs a year!



I know there are some that don't like it, but I have burned unleaded fuel, mogas, for most of my engine's ~2100 hr life. 92 Octane ETOH -free boat gas at home and on the road where I can find it. Swift fuel is wonderful, too. If only 100LL is available it does not cause any problems, except for the high price!. I mix a bit of Marvel Mystery Oil in the car gas, only because an old engine guy I trust said it helps. Well, it is cheap and it certainly does not seem to have hurt, so I continue to use it. I did modify my right side fuel system with a pump to push fuel from the tank to avoid vapor lock although I have never seen it occur. I have seen pneumatic lock, where hot fuel boils in the carb bowl causing an over rich condition - it is easily handled with the mixture knob. An added bonus of mogas is the engine is clean as a whistle inside.

If you are really cheap (I am) you can get mogas at a local station for pump price -\$.07 off coupon per gallon - 4% cash back on a credit card - \$.023/gallon rebate from the state for not using the gas on roads. **It all adds up after 12,000 gallons.** I figure on average I have saved about \$2/gallon on fuel or \$24,000 so far on this engine. Free overhaul? Not quite, but I'll take it!

The O-320 has not been completely trouble free over it's life so far, but it has been pretty good. The P-mags have seen several software upgrades and a new main board on one side. I have been happy with these ignitions - they just work. I replaced an engine driven fuel pump at 1500 hrs, a painless swap after I learned the tricks. The Suzuki Samurai alternator had an issue at 1000 hrs - turned out to be the connector, but the lifetime warranty from O'reilly Aviation provided a free replacement and all was well again. I found an exhaust gasket leak on #2 at 700 hours - flattened the exhaust pipe flange, installed a new gasket, and all was well. The only major

maintenance I have had to do was to replace an exhaust valve on #1 once it failed a compression check. We ran it a while, still leaked, staked and rotated it, still leaked. Engine shop installed a new valve for \$350 - stopped leaking. An added bonus, #1 is now my coolest cylinder - go figure! One last thing - I had the solenoid mounted on the starter go bad at 1800 hrs. Starts became slow and wonky. The solenoid is a part from a Crown Vic - guess where I got the part? 15 min install. Spins like a turbine again.....

I have done some experiments over the years - not sure if they did any good, but they were fun. I built a plenum over the top of the engine to seal in the cooling air. Does it look good, not really. Does it cool better? Maybe, but not much. Did I have fun researching and building it? You bet!! I also tried my hand at an exhaust fairing at the cooling exit. If I went faster, it was only by a knot or 2, and it seemed to raise my CHTs. I coulda done better on that project.

What are the extremes this engine has seen? North to Ely, MN - South to Montgomery, AL - East to the Poconos Mountains - west to Moab UT. Landed and took off from Leadville, CO at 85 degrees F, landed and took off from Moab at close to 100 degrees F. I have flown on sunny -5 degree F days here in Minneopolis (climbed like a rocket) and departed middle of nowhere (McCook) Nebraska at 107 degrees F (climbed like a pig). I have seen CHTs of 435, and oil temps of 230. I have not managed to break her (yet!)

My plan is to watch the engine carefully with oil filter inspections for metal, compression testing, oil analysis, and borescope inspections every 50 hours. I think she will tell me when she is done. She owes me nothing at this point, so I am very happy - it would be great to get 2500 hours out of her!

Secrets? Not really sure. I think the mogas, LOP and running cool helps a lot. I think flying a lot helps **a lot**. Maybe I'm just lucky, but the beast likes to be exercised! Good luck with your engine!!

Saving one Back at a Time – a RV Tug

- Mark Erickson

I got the idea to build a tug when I was doing the final assembly of my RV-9A. Bernie Weiss offered me a spot in his hangar at Anoka airport. Bernie was in between RV's at the time having sold his beautiful 7A and working on his new 9 at home in his garage. Bernie is one heck of a nice guy and together with Alex



Peterson and Pete Howell I could not have asked for a nicer group of hangar mates.

Bernie also owns a Beechcraft that is in the hangar. At some point in the not too distant past it lovingly acquired the nickname "Sky Pig". If you're not familiar with it ask him about it the next time you see him. Now the Beechcraft is a big plane and Bernie has one of those one-wheel tugs that clamp on the strut of the nose wheel. It's gas powered, a bit comber some and it needs to be manhandled around in order to get the job done. It didn't run very well, always seemed to be running very rich as if the choke was on even though it didn't have one.



A tug for Bernie

After Bernie was there and gone the hangar would always stink of engine exhaust. When I finally had enough of the fumes I fixed it for him. Had to do some modifications to the plastic (yes, I said plastic) carburetor but got it to run much better. No more stinky fumes when he moved the Beechcraft. As the months went by and watching Bernie having to struggle with moving the big plane in and out I decided one day to do something to help make his life easier. I would build him a tug.

The tug that I built him was similar to one that I had used in the past. It was big, easy to use, and Bernie loved it. It works by putting a hook around the nose gear and winching it up on a platform, and using a gas engine, moves the plane around anywhere you want. It works great for the Beechcraft, for an RV..... not so much. The problem is you can't just throw a hook around an RV nose gear.

The day came when Bernie needed his hangar space back to complete the assembly of his RV-9 and I had to leave. Tom Berge stepped up and found room in the hangar next to his at Crystal Airport and I was all set. I got to know Tom Berge shortly after starting the build on my RV-9A back in 2006. It turned out that my sister in law had worked for him back when Tom owned a printing company. My fist ride in an RV was with him in his 7A; he looked over my work and offered advice when building my plane, and even invited me to ride along on a trip to Oshkosh one year. Anyone who knows Tom will tell you he is one of the best guys you'll ever know!

Meeting Tom in '06 one getting to know him a little bit over the years I am always impressed by his willingness to help anyone who asks for it and his generosity with his time. I decided that I needed to do something in return, to show him that I appreciate all that he has done for others and me in our RV community. And you guessed it, I built him a tug.



First test of Tom's tug

When I started designing a tug that would work for an "A" model RV I had to layout a few requirements. (1) Electric powered. Didn't want to mess around with gas and oil and all things associated with it. (2) Small but powerful enough, purpose built for an RV type aircraft. I'm not trying to move an AT6. (3) And to me the most important, easy to use. I didn't want to be bending down trying to line up some pin in a hole of the wheel pant. The machine that I ended up putting together fulfilled all of these requirements. I even put in battery warmers connected to a thermostat because I knew Tom's hangar wasn't heated in the winter. I let Tom use it for month or two before I painted it just in case any changes had to be made. Other than a change in the angle of the forward wheel chock it has worked perfectly.

Time went by and I thought I was done building tugs, I'd run into Tom and ask him how it was working and he'd say great! He went on to say that whenever he had a student or someone who's plane he'd be working on, saw him moving his plane around with the tug, they would ask him where he got it. Tom told me if I will build them, he could sell them.



New lifting design

The problem is I would have to come up with a whole new design for lifting up the nose wheel. The first one took a lot of hours to build not only because of the design, the trial and error, but also because it had a large parts count. I needed it to be simpler. It took a lot of thought, some scribbling on a few



sheets of paper, and playing around with some pieces of wood mock-up parts of the wheel chocking mechanism before I was happy with it. In the end after the build was done, I had cut the parts count in half. Not only that but it works perfectly. The first one always takes a lot time because you're still figuring it out as it's going together. I didn't keep track of the hours it took but I did take detailed notes on all the parts that I had to make so the next one will go much faster.

Second generation frame

Frank Huber got the first tug of my newest design. He told me after using it, that it's been working wonderfully and has made all the difference moving his plane in and out of the hangar. I've still got a battery cover to finish up for it, but as I'm currently working out of town it's delayed for a bit.

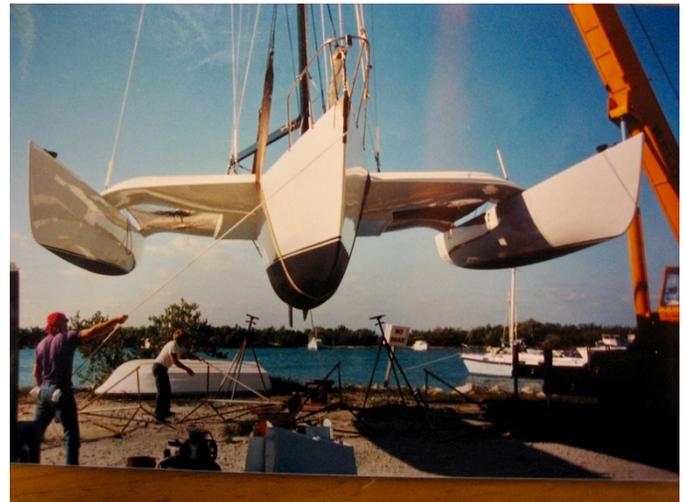


First and second generation



Frank's tug unfinished

As anyone who has done it, when you're working away from home, your life sort of gets put on hold. You're away from your family, friends, and the people you love, that's easy to see. But if you're someone who likes to tinker, design, and build things, it's even harder. I love working with my hands, always have. When I was younger I use to work on cars, and build motorcycles. A stint in the Navy left me in Key West. Lots of big water there so I built and successfully raced a 41-foot fiberglass trimaran sailboat. It was fast enough to water ski behind. I sold it back in '98 and it's still sailing and wining races.



Mark's trimaran racing sailboat

I restored older ford pickups, '48-'50 is my favorite model. Built a house... What I mean to say is, I miss being in my shop and that's another one of the hard things when working away from home. I should get my life back sometime this spring when my part of the job I'm working on is done, and then I plan on retiring from the workforce in the summer. Tom Berge thinks there's a market for these tugs. If there is I'll build them. Doug has asked if it will work on a tail dragger, and my reply is, I'm sure I can come up with something that will do the job just fine.



Frank's tug completed

You may ask, "Why would you need a tug to move around these lightweight RV aircraft?" Well, maybe your not as young as you were, maybe there's just a little bit of an incline to push it up against, that patch of ice that always seems to be right where you need to walk in the winter. There are lots of reasons. In the end, it's easier, and I don't know about you, but as I've aged, I've become rather fond of the "easy button"!

Passages

- Tom Berge

I'm sitting here watching the rain fall on another dreary fall day in November, thinking about the past year or so of flying. With the passage of time, it's always nice to recap the adventures that have come to pass. Some of these adventures involve travels to faraway places while others are situations causing me ask "How did I get myself into this mess?" Such is the life of a pilot.



Springtime brought a wonderful trip to southern Texas to help a friend with his annual, then off to Clemson, South Carolina to visit our very good friends Doyce and Linda. Weather played a role as it generally does, cutting short the Clemson portion. On the return trip, I got into a load of carb ice that made me sit up nice and straight. Problem was solved, but Karen was not happy. Note to self: "pull on carb heat before entering the clouds."

Summer brings long days and warm temperatures, making it the premier time to travel. Late June found me helping a new pilot with a pre-buy inspection on an RV6A he was interested in. This was in Sequim, WA, west of Seattle. A deal was struck, money exchanged hands and off we went to Boise, ID

for an overnight. Andrew was a new pilot and this is how the trip unfolded. We departed from a 1600 foot x 25 foot "runway" heading towards Boise and landed on a 10000 foot x 150 foot runway. From one extreme to the other! The overnight had us near a nice restaurant where I ordered a rack of ribs that, shall I say was simply too much? I gave a third to Andrew and still couldn't finish. The following day we overflew Jackson Hole, past the Grand Tetons, with stops in Riverton, WY, Casper, WY and Canby, MN before finding home. Casper was for weather and the rest were fuel stops.

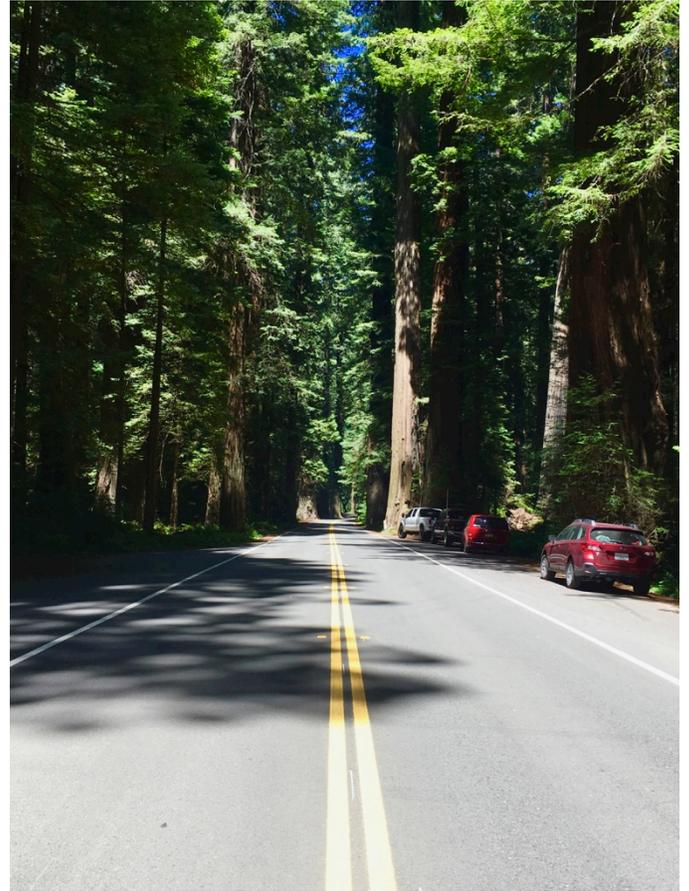
Five days later, I'm off to southern California looking at an RV7A. Another deal struck and off we went heading for home. We climbed out high and upon level off, noticed our oil temps remained stubbornly higher than expected. We stayed at 220 to 230 degrees. Never saw that on the test flights. Well, like weather out the window, these were the cards we were dealt, so we played them. We planned a fuel stop at Flagstaff, AZ then Albuquerque, NM for the overnight. I've stopped many times at KABQ and have always gone to Cutter Aviation. I guess it's because they have always taken good care of me. On taxi out the next morning I was doing radio chores and after initial contact, the controller asked if we were one of those "high performance homebuilts?" Looking over at Frantz with raised eyebrows, I keyed the mic and said, "Why of course we are. What kind of question is that?" She chuckled and agreed it was a crazy question. How would you have answered? "No, we're a low performance homebuilt?" I doubt it. Next stop was Hays, KS then home. These two trips happened over a 7-day period. Six days later, I locked the front door again.

As some of you may know, every couple of years I try to put together a summer trip in a group format. Years past have brought trips to Durango, CO and Yellowstone National Park. These are designed to get people out to places they may not go on their own as well as the camaraderie of flying with like-minded folks. There are lots of interesting places to see in our great country and all are available by RV in one form or another. This year's trip covered a greater distance than average for the 7 RV's who dared.

Leg one was to Dickinson, ND for a fuel stop. Our first and thankfully only trip changing mechanical casualty happened there. One bad mag and now we were 6. Bruce and Tom returned home and missed the trip. The balance of the trip presented one flat tire and two, yes two, damaged wheel pants. Please don't ask. The last anomaly was an aborted takeoff due to a sputtering engine associated with density altitude. The field elevation was 504 feet MSL but the temp was 106. Too much throttle, too fast caused the stumble.



Clark Fork River, ID



Redwood National park

Outbound stops along the way were Kalispell, MT, Everett, WA, McMinnville, OR and Redding, CA. Points of interest were Glacier National Park, the Boeing Factory, the Spruce Goose and the Redwood National Park, respectively.



Glacier National Park

The return trip included Boise, ID, Idaho Falls, ID for the overnight, Casper, WY and then home. Casper had an unexpected surprise in store for us. Listening on the radio inbound, I thought I heard a reference to a B-25. With my ears perked up, I continued and wouldn't you know it, sitting on the ramp was a B-17! Then behind us the B-25 landed. If there was a downside to this experience, the B-17 took all the gas out of the fuel truck. Now we had to wait for the fuel truck to refill

so we could get gas. All we could do was smile and roll with the punches.

Regarding the messes I found myself in the last year or so, all were in RV12's. The first mess was a sizable oil leak while test flying that quickly removed a quart and a half or so from a 3-quart capacity. Wearing shorts, as I'm apt to do in the summer, I noticed a splatter hitting my leg. I wiped my leg and noticed nothing, put my hand on the throttle and it slipped off. One nano second later I realized I had an oil leak. This happened on takeoff so one trip around the patch blew out 1.5 quarts. Yikes! The second anomaly involved a pitot tube leak. It didn't completely kill the airspeed, but it sure wasn't accurate. This was during a training flight and Wilbur flew the same attitude we always did and it worked out like nothing was amiss.

The final mess was a bit more interesting. I had flown the test time off this particular RV12 and all was well. The next flight was to the paint shop with the builder flying left seat and me sitting right. The plan was to move the airplane to the paint shop in Hibbing and get in some transition training along the way. Upon level off, Jim tried to trim but was having difficulty. Having seen students struggle with trimming in the past, I had Jim hand over the controls and as soon as my hands felt the controls, I knew we had a problem. As I recall, I said something like "s**t" as I looked over my shoulder. A wave of relief hit me when I saw the stabilator move as I moved the stick, but it was sloppy. We decided to continue to Hibbing instead of turning back. I keyed the mic and told Doug, flying our return ride, of our issues. Guess who got to do that landing? Arriving in the Hibbing area, which is normally a quiet place, I found the sky full of traffic. The thought hit me "don't these people have jobs they should be at"? I could have used fewer distractions.

We were missing about half of the stabilator travel and wouldn't you know it, it was the half I really needed. Trimming the nose slightly down allowed me to know exactly how much control I had. I didn't want to risk trimming neutral, then getting into PIO close to the ground. Running out of authority just above the runway, I plopped it down, mains first but not by much. If I had to do it again, and I hope never to see that again, I think perhaps using only half flaps may have given me a bit more control. Arriving at the paint shop, Doug was there waiting for us and as I recall, he didn't look too happy. He grabbed the control surface while I moved the stick back and forth, my oh my, isn't that interesting?

Go out and fly! Gather up some memories so you too can reflect on the adventures that wait. Now as I finish writing, the snow has started. I'd go into my corner to sulk but there're still places to go and things to do. Winter is a weak excuse for not flying!

Autopilot Woes

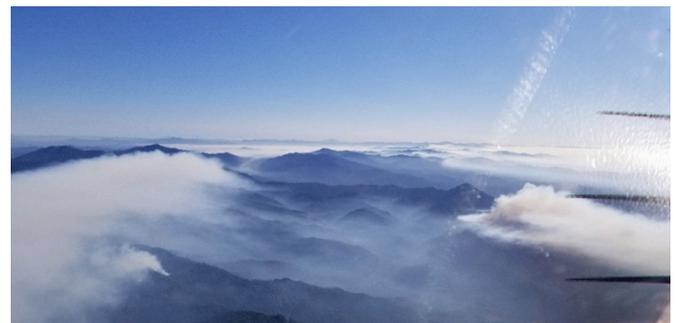
- Warren Starkebaum

After nearly 14 years of on and off construction, my RV-7 first flew in August 2014 with Doug doing the honors. I had some initial teething issues with the com radio, but once I learned how to configure it problem, everything worked fine. I especially like the Dynon Skyview system and its autopilot. I use it all the time flying in and around the Class B here in Minneapolis. I have made three trips to Oregon and have marveled at how well it works to make cross-country flying so easy. That is, until my trip this summer.



The first AP anomaly was something that I did not recognize as such at the time. Early this summer, I departed KMIC and headed east. After leveling off at 2300', I engaged the AP (track and hold) and to my surprise, the airplane immediately began to descend. I disengaged the AP, leveled off, carefully trimmed the airplane for level flight and departed Class B. When I reengaged the AP, the airplane flew straight and level just as I had expected, and it AP continued work fine for the next 15-20 hours.

Later this summer, though, I experienced three separate and apparently unrelated AP anomalies (or failures). This past July I am level at 8500' somewhere in the middle of SD on my way to a reunion in Walla Walla Washington, and then on to Grants Pass in SW Oregon to visit my son. It is perfectly clear and smooth, and I just happen to sight along the forward edge of the cowl and notice a very slight pitch oscillation occurring at about 10-15 second intervals. The oscillation was not enough to cause any altitude change. Interesting, I thought; I had never noticed that before.



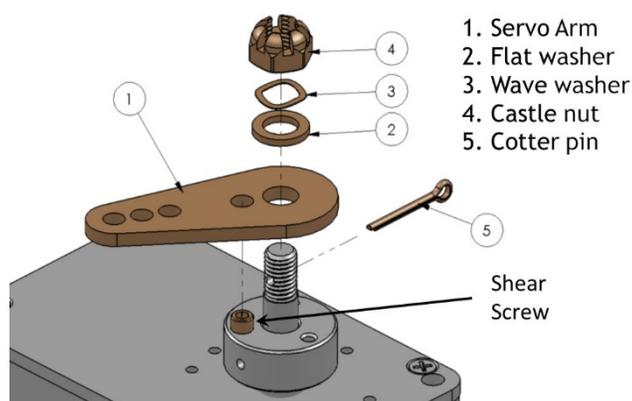
After spending a couple of days visiting my son, I left Grants Pass Ore. about 8:30 and headed to Cody Wyoming. Except for some smoke from forest fires that had popped up in the

couple of days I was in Oregon, the weather was great. As I



approached the Rockies and its spectacular scenery, I decided to climb to 15K' to reduce the early afternoon turbulence. (Yes, I had O2, thanks to Pete Howell). The AP had been working fine at lower altitudes, but when I leveled off at 15k', the AP would not hold altitude at all. I knew something was haywire, although I did not consider the malfunction a flight safety issue with VFR in good weather. I hand flew the remaining hour or so to Cody, where I landed uneventfully, refueled, and headed for home. For the rest of the trip at lower altitudes (i.e., ~7500'), the AP altitude hold seemed to work OK, although occasionally, I was getting un-commanded autopilot disconnects. Or did I just bump the AP disconnect on the stick?

As I motored along to and from Wash & Ore and back to KMIC, I had some time to think (about 20 hours) to ponder what might be causing the AP anomalies. Perhaps there was a fault with the disconnect switch (mounted on my stick), some sort of wiring fault, a problem with the AP servos, or some fault within SkyView unit.



Back in Minneapolis, I reviewed numerous posts on VAF and Dynon's discussion forums and found a few references to broken servo shear screws. I removed to baggage bulkhead to get at the pitch servo, and sure enough, the shear screw was broken. Even with the shear screw broken, there is still a bit of friction between the servo arm and motor, which is probably why altitude hold worked much time, but not always.

Before this, I was not aware that the AP servo had a shear screw, but it is apparently there to mechanically couple the servomotor to the servo arm. If the torque of the servomotor

exceeds some level, the shear screw can shear off, I assume, to prevent damage to the servomotor.

I called Dynon Tech Support and they shipped a shear screw repair kit. After installing the new shear screw, I put everything back together, and test flew the airplane. Everything seemed to work just fine. Altitude would hold as it should, and there were no AP disconnects. My SkyView system is an early version from Dynon, and broken shear screws have been reported before. Dynon now uses a more robust version to reduce the occurrence of breakage.

The airplane flew just fine for the next ten hours or so, and then to my consternation, I started to get AP disconnects again. I removed the aft bulkhead in the baggage compartment to check the pitch servo shear screw, and it was fine. I then called Dynon Tech support again, and they suggested I send them the SkyView Diagnostic file, which can be downloaded from the SkyView system. Dynon Tech Support reviewed the diagnostic file and said there were errors in the Roll Servo position and requested I return the servo for repair. Dynon replaced the servo circuit board, and found the servo shear screw broken, so they replaced that too. A week or so later, I had the servo back and installed. Interestingly, except for the autopilot disconnects, there was no indication that the roll servo was malfunctioning, such as failure to hold heading.

After installing the repaired roll servo, all was well for a few hours, but then I started getting AP disconnects again. Again, I sent a SkyView diagnostic file to Dynon, and this time they said that the roll servo was dropping off line, i.e., there is a problem with either a 12V line or ground. The roll servo position error that was there previously was (thankfully) absent.

When I had replaced the pitch servo, I had carefully traced the pitch and roll servo yellow disconnect lines from the servo, though all the various connections to the disconnect switch in the stick. I had not checked my servo ground lines though.

I have a 'forest of fast-on tabs' ground block bolted to firewall for all my grounds. I thought perhaps one of my servo grounds had loosened, but on inspection, all the grounds were tight, as were the wire crimps on the female fast-ons. I removed the roll servo ground anyway and gave the crimp an extra squeeze with my ratchet crimper and put it back on. I swear, that's all I did. Now with about 10 hours since I wiggled the roll servo ground, I have experienced no further anomalies.

So, within about six weeks, I experienced broken shear screws in the both AP servos, a bad circuit board in the roll servo, and an intermittent ground from one of the servos. In retrospect, I suspect the ground issue was there even before my trip to Washington and Oregon but it was never clearly evident until my issues with the pitch and roll servos were resolved. I am optimistic my autopilot issues are resolved, at least for now.

Funny thing happened at the FSDO the other day.

- Tom Berge

FAA Safety Team **FAASTeam**

A former student asked me to be his recommending instructor through the

FAA's IACRA system for a drone license he was applying for. Just a qualifier, the FAA IACRA system is not as intuitive as say ordering from Amazon. Not having any experience doing that and after attempting to figure it out by myself, I decided to visit our local FSDO. Turns out they were very happy I asked for help instead of submitting the form incorrectly.

While there, another FAA guy came out and made a comment about knowing my name. Crap! I denied any knowledge, told him it wasn't me and he couldn't prove anything! It didn't work. He asked me to accompany him to his office and since they had locked the front door, I had no choice!

Rest assured, I gave up precious few of your names. The gentleman's name was Al Thilmany and he's the FAASTeam Program Manager responsible for the Wings program. He related investigating an astronomical amount of both accidents and incidents in the past few years. We all know these do not reflect well on us as a pilot population. Training being a buffer to these types of these occurrences, he promoted the Wings program as one solution available to us at no cost. These seminars typically fall on weekends and cover a variety of interesting subjects. It's been a while since I've attended one of these, though my intentions were always to do so. Perhaps we should all consider taking in a seminar or two in an attempt to keep our flying skills up to date. The weather will suck for the next few months, so give it a thought.

TC RV Builders December Meeting
Saturday, December 15, 2018 – 10:00 am - noon

**Doug and Paul's hangar, Lake Elmo Airport (21D)
41C, Mooney Lane**

Once a year we devote a meeting to what we call the "RV Roundtable." The plan is an informal get-together where we throw out a variety of topics and let the discussion flow as they may.

Our moderators are Tom Berge and Doug Weiler. We'll kick around some possible topics such as what RV is right for you, organizing a building space, learning building skills, tools, engines, props, avionics... you name it. We can dream about that first test flight, transition training, places to fly, maintenance, insurance, whatever!! If you are new to the RV world, have just started a project, or just thinking about it, you'll want to be sure to attend.

As usual we'll have coffee, juice, and a pleasing assortment of Christmas-time goodies for your caloric pleasure.

See you there!!!!!! **BTW, please park on the hard surface.**

Directions: From I-94 go north on Manning Avenue (County Road 15) about 3 miles. Turn right at the second entrance to Lake Elmo airport just before the railroad tracks. Go east past Lake Elmo Aero and follow the road to the left. Go just past the old Civil Air Patrol hangar on the right. Then turn right on Mooney Lane. We are the fourth hangar on the left (41C.) **Call Doug if lost: 651-398-1184.**